REMARKS

Review and reconsideration on the merits are requested.

Claim Amendments

In amended claims 1 and 4, the recitation "a(a) said plurality of sheets made of said fiber-reinforced composite are heated at a temperature of 20-100°C under 0.1 to 10 kg/cm^2, and cooled at a temperature of 10-30°C under 0.1 to 10 kg/cm^2 so as to avoid the generation of disordered fiber orientation of the fiber-reinforced composite and the formation of insufficient stacking of the flat board-shaped laminate;" finds support at page 4, line 24 to page 5, line 11 of the specification.

In amended claims 1 and 4, the recitation "(c) said board is softened by heating at a temperature of 60-100°C for 10-90 minutes placed on a forming tool, and formed by cooling at a temperature of 0-50°C under a pressure of 0.1-10 kg/cm^2 so as to avoid the generation of disordered fiber orientation of the fiber-reinforced composite and the occurrence of insufficient forming of said intermediate products", finds support at page 5, lines 15-28 of the specification.

Applicant now addresses **DETAILED ACTION** and follow the paragraphing of the Examiner.

Paragraph 3

The objection to claim 7 as being dependent on canceled claim 5 is corrected.

Withdrawal of the objection is requested.

Applicant now addresses the rejections over art.

The prior art considered: U.S. Patent 5,954,898 McKague et al (McKague); JP 02030518 Hiyamizu et al and its English language translation (Hiyamizu); U.S. Patent 4,749,729 Kohli et al (Kohli newly cited); U.S. Patent 4,269,884 DellaVecchia et al (DellaVecchia).

The rejection: all pending claims, claims 1, 4 and 7, are rejected under 35 U.S.C. § 103(a) as being unpatentable (obvious) over McKague in view of Hiyamizu (and its English translation), Kohli and DellaVecchia.

This rejection is respectfully traversed.

With respect to amended claim 1, Applicant focuses on avoiding the generation of disordered fiber orientation of the fiber-reinforced composite and the occurrence of insufficient forming of the intermediate product, which limitation has been added to first step (a) and third step (c). See amended claim 1 and page 4, line 24 to page 5, line 11 and page 5, lines 15-28 of the specification.

In direct contrast to the present invention, although McKague teaches that the McKague laminate can be generally stored for cutting at room temperature for keeping in a low temperature storage environment due to the hygroscopic nature of the composite material (McKague, column 6, lines 8-11), McKague is silent regarding:

First step (a) of the present invention with respect to the conditions for cooling (specific temperature and pressure);

The conditions for laminating by heating a plurality of sheets made of the fiber-reinforced composite at a specific temperature/pressure,

To thereby avoid the generation of disordered fiber orientation of the fiber-reinforced composite and the occurrence of insufficient forming of the intermediate product;

McKague is further silent regard the necessary conditions defined in third step (c) such as:

Heating and at a specified temperature and pressure for softening and cooling at a specified temperature/pressure, thereby avoiding the generation of disordered fiber orientation of the fiber-reinforced composite and the occurrence of insufficient forming of the intermediate product. See the specification at page 5, lines 4-11 and lines 15-28.

With respect to Hiyamizu, Hiyamizu teaches a device for continuously producing fiber-reinforced composite materials by laminating and pressing a plurality of prepegs at 100-160°C by using a hot roller (see English translation of JP '518 attached to the Action (hereinafter referred to as English translation), page 6, line 23 to page 7, line 4), which is different from the present invention in heating at 20-100°C in step (a), because when the heating temperature is more than 100°C, fluidity of the resin in the fiber-reinforced composite is excessively increased (see page 4, lines 25-27 of the specification). Additionally, Hiyamizu fails to teach or suggest a cooling temperature, whereas the cooling temperature in step (a) of the present invention is set at 10-30°C.

In this regard, Applicant wishes to direct the Examiner's attention to the fact that in amended claim 1 herein, in first step (a) the plurality of sheets made of the fiber-reinforced composite are heated at a specific temperature and pressure and cooled at a specific temperature and pressure so as to avoid the generation of disordered fiber orientation of the fiber-reinforced

composite and the occurrence of insufficient forming of the intermediate product. Hiyamizu is completely silent on this aspect of the claims.

Thus, though McKague might suggest the use of epoxy resin as a thermosetting resin used for an intermediate product made of a fiber-reinforced composite and Hiyamizu might teach a device for continuously producing fiber-reinforced composite materials by laminating and pressing a plurality of prepegs at 100-160°C using a hot roller, one skilled in the art referring to McKague and Hiyamizu, alone or in combination, would not reach the limits of the claims herein nor would that person skilled in the art find the limits of the claims herein obvious. Certainly there is nothing of record suggesting the obviousness of the limits of claim 1.

With respect to Kohli, Kohli might discloses epoxy resin compositions curable above 160°F (71°C) and below 250°F (121°C), which cured resins are useful as adhesives and as matrix resins in reinforced composites, with excellent physical properties (see Abstract). Thus, although Kohli might describe a curable resin-fiber matrix composition comprising an epoxy resin and a reinforcing amount of a reinforcing fiber, e.g., 20-60 parts by part of the curable epoxy resin composition of the reinforcing fiber per 100 parts by weight of both components combined, the reinforcing fiber including glass fibers, graphite fibers, carbon fibers, polyaramid fibers, and the like (column 5, lines 39-45 of Kohli), Kohli fails to teach or suggest a method for producing an intermediate product made of fiber-reinforced composite as claimed herein, and Applicant wishes to specifically emphasize the failure of Kohli to remedy the defects of McKague and Hiyamizu with respect to:

First step (a) of claim 1 where the plurality of sheets of fiber-reinforced composite are heated at a specific temperature/pressure and cooled at a specific temperature/pressure so as to avoid the generation of disordered fiber orientation and the occurrence of insufficient forming, etc.; and

Kohli is noticeably silent in remedying the defects of McKague/Hiyamizu with respect to third step (c) of the present claims where the board is softened by heating at a specific temperature/pressure on a forming tool and formed by cooling at a specific temperature/pressure so as to avoid the generation of disordered fiber orientation and the occurrence of insufficient forming, etc.,

whereby one obtains an intermediate product which is a semi-hardened product having a hardening degree of 1 to 80% as claimed in claim 1.

Summary on McKague, etc.

In short, with respect to McKague/Hiyamizu/Kohli, even if McKague suggests the use of epoxy resin as a thermosetting resin used for an intermediate product made of a fiber-reinforced composite, Hiyamizu teaches a device for continuously producing fiber-reinforced composite materials by laminating and pressing a plurality of prepregs at 100-160°C using a hot roller and Kohli describes the curing temperature of the curable resin-fiber matrix composition comprising an epoxy resin and a reinforcing fiber at temperature in a range of 71-121°C, quite clearly one of ordinary skill in the art from this prior art, alone or in combination, does not reach the limits of claim 1 of the present application nor is there anything of record which would motivate one of

ordinary skill in the art to modify the combination of McKague/Hiyamizu/Kohli to reach the limits of claim 1.

Turning to DellaVecchia, DellaVecchia might disclose a process for producing a composite laminated sheet including laminating sheets in laminating rolls at a temperature 10-70°C below the polymer melting point (maintained at a different temperature, e.g., 5-40°C below and 10-70°C below in each laminating roll of the laminating rolls (a) to (d)) under a pressure of 100-1500 lb/linear inch to form a laminated sheet (see column 2 line 56 to column 3, line 34 and Fig. 1), and cooling the laminate 25 at cooling rolls at a temperature capable of quickly lowering the temperature of the laminate 25 sufficiently for each cutting on cutter mechanism 26 (see column 3, lines 43-45, and Fig. 1), these conditions in DellaVecchia are quite different from those of the present invention as set forth in first step (a) involving a specific heating temperature/pressure and a specific cooling temperature/pressure. Further, DellaVecchia is completely regarding the effects achieved using these conditions, namely avoiding the generation of disordered fiber orientation and the occurrence of insufficient forming of the intermediate product, etc.

Thus, even though McKague, Hiyamizu and Kohli might contain the teaching under Summary of McKague, etc. above presented, and DellaVecchia might disclose a process for producing a composite laminated sheet including the steps of laminating the sheets with laminating rolls at a temperature 10-70°C below the polymer melting and cooling the laminate at cooling rolls at a temperature capable of quickly lowering the temperature of the laminate sufficiently for easy cutting on a cutter mechanism, there still is no suggestion in the combination

of references of the conditions of claim 1 and the fact that the conditions claimed will permit avoiding the generation of disordered fiber orientation and the occurrence of insufficient forming of the intermediate product, etc.

Applicant would now like to offer several comments regarding the hardening degree.

The Hardening Degree

Another distinguishing feature of claim 1 of the present application is found in the fact that the intermediate product is a semi-hardened product having a hardening degree of 1 to 80%, where the fiber-reinforced composite is composed of a reinforcing fiber impregnated with a thermosetting resin. The silence of the art relied upon is glaring on this point. None of McKague, Hiyamizu, Kohli or DellaVecchia suggests in any fashion this aspect of the present invention.

While the Examiner might take the position that such a hardening degree would be "obvious", and the Examiner has taken this position in the paragraph bridging pages 4/5 of the Action, the Examiner has advanced no reasoning or proof of record to support the Examiner's conclusion that:

"It would have been obvious to one of ordinary skill in the art at the time the invention was made to experimentally determine/optimize the particular extent of the partial curing, i.e., hardening degree, taught by McKague et al as modified by Hiyamizu et al and Kohli et al as a function of the type of additional processing required to form the finished/final product as doing so would have required nothing more than ordinary skill and routine experimentation."

Applicants respectfully submits that the Examiner's reasoning on this point is flawed since the Examiner offers no support of why one of ordinary skill in the art would have experimentally determined/optimized any particular extent of partial curing, and certainly offers no basis to support the conclusion that such experimental determination/optimization would be viewed by one of ordinary skill in the art as "a function of the type of additional processing required".

In short, Applicant respectfully submits that there must be something of record other than a mention of "hardening degree" or like terminology to render obvious a hardening degree as claimed in claim 1 herein.

Withdrawal of the rejection of claims 1, 4 and 7 as obvious over McKague/Hiyamizu/Kohli/DellaVecchia is requested.

Specific Traversal on Amended Claim 4

In this section, Applicants would like to focus on the patentability of claim 4 over the prior art relied upon.

If the Examiner will compare amended claim 1 and amended claim 4 (hereafter simply claim 1 and claim 4), the Examiner will see that down to the end of claim 4 where the "wherein" clause begins, claim 1 and claim 4 parallel each other. Accordingly, each and every argument earlier advanced with respect to the combination of references applies with equal strength to claim 4. However, additional reasons established the unobviousness of claim 4, as now explained.

First, the Examiner is requested to note that claim 4 is basically directed to a method for producing a semi-hardened stringer intermediate product or a semi-hardened frame intermediate. Again, the product(s) are produced by a process involving steps (a) to (c) where steps (a) and (c) involve specific temperature/pressure conditions and are conducted so as to avoid the generation of disordered fiber orientation of the fiber-reinforced composite and the formation of insufficient stacking (step (a) of the flat board-shaped laminate and the occurrence of insufficient forming (step (c)) of the intermediate product.

In more detail, claim 4 recites a T-shaped intermediate product composed of L-shaped board laminates and a flat board-shaped laminate as an intermediate product. The L-shaped board laminates and the flat-shaped board laminate are derived from only one flat board-shaped laminate by cutting into a plurality of boards. The intermediate product is a semi-hardened product having a hardening degree of 1 to 50% (not 1 to 80%), so that the fiber-reinforced composite composed of a reinforcing fiber impregnated with a thermosetting resin thus produced can be easily handled and stored and has properties suitable for integration with the skin (see page 4, lines 9-13 of the specification).

In accordance with claim 4, to produce a semi-hardened stringer intermediate product or a semi-hardened frame intermediate, in first step (a) specifically defined heating/pressure and cooling/pressure conditions must be observed to avoid the generation of disordered fiber orientation and the formation of insufficient stacking, etc., and in the third step (c) specific heating/softening temperature/time conditions must be observed in combination with specific

temperature/pressure conditions for cooling to avoid the generation of disordered fiber orientation and the occurrence of insufficient forming, etc.

There clearly is no suggestion in the prior art of the conditions required in step (a) and step (c) of claim 4 which make it possible to avoid the generation of disordered fiber orientation of the fiber reinforced composite and the occurrence of insufficient forming of the intermediate product.

Further, the conditions in the first and third steps in claim 4 affect the formation of a T-shaped intermediate product composed of L-shaped board laminates and the flat board-shaped laminate as the intermediate product, which is a semi-hardened product having a hardening degree of 1 to 50% (not 1 to 80%), so that the fiber-reinforced composite composed of a reinforcing fiber impregnated with a thermosetting resin thus produced can be easily handled and stored and has properties suitable for integration with the skin (see page 4, lines 9-13 of the specification).

In contrast to the invention defined in claim 4, none of McKague/Hiyamizu/Kohli/DellaVecchia teach or suggest the conditions in first step (a) which make it possible to avoid the generation of disordered fiber orientation of the fiber reinforced composite and make it possible to avoid the formation of insufficient stacking of the flat board-shaped laminate in combination with the conditions in third step (c) which make it possible to avoid the generation of disordered fiber orientation of the fiber reinforced composite and the occurrence of insufficient forming of the intermediate product.

Lacking such teaching in the prior art, there can be no motivation to reach the limits of claim 4 to achieve the effects recited.

Remarks in Action Pages 8/9: Specific Traversal

In the paragraph bridging pages 8/9 of the Action, the Examiner states as follows (bolding was added by the Examiner):

> "McKague discloses a method of fabricating partially cured (i.e., semi-hardened) intermediate parts (performs) from fiber-reinforced composites wherein a plurality of the partially cured parts may be assembled to form a composite part (Figure 4) **and then (optionally) fully cured**. Thus, the assembly of partially cured parts is a composite part formed from a plurality of composite layers that are semi-hardened. As to the specific hardening degree of 1 to 80% or 1 to 50%, the rejection above sets forth the reasons it would have been obvious to one of ordinary skill in the art to determine the hardening degree."

While Applicant will in a second focus of Figure 4 of McKague, Applicant respectfully submits that the Examiner has taken the concept of "then (optionally) fully cured." in McKague far beyond the limits of what this would suggest to one of ordinary skill in the art. The options available to one of ordinary skill in the art are to fully cure or optionally cure to any degree; there simply is no other suggestion in McKague and there simply is no suggestion in McKague of optimizing to reach the 1 to 50% degree of hardening or curing of claim 4.

Specific Comments on the Teaching of Fig. 4 of McKague

FIG. 4 of McKague merely shows the steps in flow 74 of FIG. 4 such that (1) laminate 82 is shaped into a pre-form of right angle pre-form 86, and after forming (2) the pre-forms are rapidly cooled before the onset of accelerated cross-linking described in connection with region 70 of curve 44 of FIG. 3; (3) multiple pre-forms may then be located adjacent to one another and subjected to a co-curing cycle in, for example, autoclave 88; (4) the pre-forms are cured together

with or without an adhesive; and (5) by an appropriate consolidation pressure, fully cured part 90 is produced, where various steps in flow 74 are controlled by control system 91.

Specifically, two pre-forms 86 of McKague, which are cooled before co-curing or curing, are co-cured in flow 74 of FIG. 4 with one plate-shaped laminate 82 which is not derived from the same plate-shaped laminate for two pre-forms 86, in an autoclave to obtain a fully cured (a T-shaped) part 90, which is not a semi-hardened intermediate as recited in the amended claim 4 of the present application (emphasis added).

From the steps in flow 74 of FIG. 4, it is clear that the second step (b) of the claimed invention is not included in the steps of McKague, which contributes to a reduction in the number of steps for the production thereof, i.e., the McKague process, as compared to that of the present invention, is not as streamlined as the method of the present invention.

Applicants appreciate that while they have not argued second step (b) to a strong degree heretofore, nonetheless second step (b) is a positive limitation in the claims herein and must be considered.

Further, in flow 74 of FIG. 4 if one assumes steps (2) to (4) of McKague are equivalent to step (c) of claim 4 of the present application, any element being processed in McKague would be in a viscous state from a minimum level 66 of region 70 to the lower half of curve 44 of FIG. 3. Thus, McKague describes only a fully cured T-shaped part 90 without teaching a degree of hardening of the pre-forms 86 and plate-shaped laminate 82 which could possibly be fully cured to the T-shaped part 90, quite different from the semi-hardened product having a hardening

degree of 1 to 50% as a final shaped product of the T-shaped intermediate product of the claimed invention.

Thus:

McKague is silent regarding the detailed conditions necessary for forming a semi-hardened stringer intermediate product or a semi-hardened frame intermediate as called for in claim 4;

Hiyamizu discloses a flat board-shaped laminate presumably having a certain degree of hardening. However, Hiyamizu fails to teach or suggest any semi-hardened stringer intermediate product or semi-hardened frame intermediate which does have or should have a hardening degree of 1 to 50% as recited in claim 4.

Kohli fails to teach or suggest a semi-hardened stringer intermediate product or semi-hardened frame intermediate. Kohli is silent regarding such products having or should have a hardening degree of 1 to 50% as called for in claim 4.

DellaVecchia discloses a laminated sheet laminate which presumably has a certain degree of hardening. However, DellaVecchia fails to teach or suggest a semi-hardened stringer intermediate product or a semi-hardened frame intermediate having a hardening degree of 1 to 50% as called for in claim 4.

Accordingly, even if one were to combine the teachings of the four references relied upon, there is simply no suggestion or motivation to reach the hardening degree of 1 to 50% as called for in claim 4, nor, it is submitted, has the Examiner provided such motivation to reach a conclusion of obviousness on this record.

In summary, the combination of McKague/Hiyamizu/Kohli/DellaVecchia does not teach the invention of claim 4, particularly to produce a T-shaped intermediate product having a hardening degree of 1 to 50% which is composed of L-shaped board laminates and a flat board-shaped laminate as the intermediate product, the L-shaped board laminates and the flat-shaped board laminate being derived from only one flat board-shaped laminate by cutting into a plurality of boards.

Accordingly, withdrawal of the rejection is requested.

Amended Claim 7

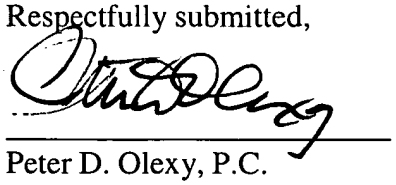
In claim 7, dependent from the claim 4 of the present application, the hardening degree of the semi-hardened stringer intermediate product or the semi-hardened frame intermediate is limited from 1-50% to 5-20%, whereby the fiber-reinforced composite thus produced can be also easily handled and stored and has properties suitable for integration with the skin (emphasis added) (see 4, lines 9-13 of the specification).

Accordingly, for the same reasons as advanced above, it is respectfully submitted that one of ordinary skill in the art certainly would not be led to the hardening degree of claim 7, and certainly this is not taught from the combination of McKague/Hiyamizu/Kohli/DellaVecchia.

Even assuming *arguendo* that one of ordinary skill in the art would select "some" degree of hardening, quite clearly there is no motivation or guidance to lead one of ordinary skill in the art to reach the hardening degree of 5 to 20% of claim 7 nor is there any suggestion that, in fact, such a hardening degree would be an optimization.

Withdrawal of all rejection of claim 7 and all claims is requested.

Respectfully submitted,



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Date: July 13, 2004